

REMARKS/ARGUMENTS

Claims 12-21 pending herein are believed to be in condition for allowance for at least the reasons explained below. Accordingly, Applicants respectfully request that the PTO withdraw the rejections of record and issue a Notice of Allowance for this application in due course.

1. The objection to the specification is noted, but deemed moot in view of the substitute specification paragraph submitted above. Accordingly, Applicants respectfully request that the above objection be reconsidered and withdrawn.

2. Claims 12-21 were rejected under §103(a) over Lu. Applicants respectfully traverse this rejection.

Independent claim 12 recites a porous material comprising silicon carbide particles as an aggregate and a silicon nitride binder bonding the silicon carbide particles so as to define pores present between the silicon carbide particles to provide an open porosity of 50% to 75%. The pores are defined by the silicon carbide particles and by a portion of the silicon nitride binder. A surface of the silicon nitride defining each pore is either free from any columnar silicon nitride, or includes columnar silicon nitride, provided that an amount of columnar silicon nitride having a thickness of more than 2 μm and an aspect ratio of less than 10 is greater than an amount of columnar silicon nitride having a thickness of 2 μm or less or an aspect ratio of 10 or more. Claims 16, 18 and 20 each depend from independent claim 12.

Independent claim 13 recites a porous material comprising, among other things, silicon carbide particles as an aggregate and a silicon nitride binder directly bonded with the silicon carbide particles and bonding the silicon carbide particles with one another so as to define pores between the silicon carbide particles. The pores are defined by the silicon carbide particles and by a portion of the silicon nitride binder, and have a specific surface area of 1 m^2/g or less, and an open porosity of the porous material is 40 to 75%. Claims 17, 19 and 21 each depend from independent claim 13.

The PTO admitted that Lu “does not specifically teach the pores between the particles are specifically defined by the silicon carbide particles and the silicon nitride binder or the pores having the specific surface area as claimed” (Office Action, page 3, lines 7-9). In an attempt to overcome the deficiency of Lu, the PTO asserted that “one of ordinary skill in the art would recognize that the reference’s structure and method of production is so similar to the applicants’, that similar characteristics of both structures would be produced and therefore, although the reference does not specifically discuss the above limitations, one of ordinary skill in the art would find it obvious that the characteristics would naturally flow from the reference” (Office Action, page 5, lines 6-11).

Contrary to the PTO’s assertions, however, Applicants respectfully submit that one skilled in the art would instead readily recognize that Lu’s structure and production method is not similar to that of the present invention. Along those lines, such skilled artisans would not have had any reasonable expectation that any otherwise undisclosed, similar characteristics would be produced or “naturally flow” from Lu.

According to independent claim 12, the amount of columnar silicon nitride present on the silicon nitride defining the surface of each pore is either zero, or is suppressed so that an amount of columnar silicon nitride having a thickness of more than 2 μm and an aspect ratio of less than 10 is greater than an amount of columnar silicon nitride having a thickness of 2 μm or less or an aspect ratio of 10 or more. These and other features of the present invention are achieved in view of the specific processing conditions discovered by Applicants and described in the present application.

For instance, in Examples 1-4 and 6-11 of the present application, the initial firing step, which is a heat treatment step performed prior to the nitriding step, is carried out under a reduced pressure (see also page 11, lines 5-7 of the original specification), or the nitriding step is carried out in the presence of hydrogen (see also page 14, line 20 to page 15, line 12 of the original specification). In Example 5, the nitriding step is performed at a high temperature of 1750°C. In Examples 12-14, the

initial firing step is performed under a reduced pressure, or in the presence of hydrogen, and the temperature employed for the nitriding is reduced.

In Lu, the green body undergoes an initial firing step where the green body is fired at 1450°C in an Argon atmosphere. Applicants respectfully submit, however, that there is no disclosure or suggestion in Lu that this initial firing step also occurs at a reduced pressure or in the presence of hydrogen.

After the initial firing step in Lu, the atmosphere is changed to N₂, and the nitriding step is subsequently conducted at 1600°C for 5 hours. Applicants respectfully submit, however, that there is no disclosure or suggestion that this nitriding step is performed in the presence of hydrogen, or at a high temperature on the order of 1750°C, which, according to the present application, are otherwise needed to suppress the formation of columnar silicon nitride.

That is, Applicants respectfully submit that the processing conditions which suppress the formation of columnar silicon nitride, as identified by the present inventors and described in the present application, are simply not disclosed or suggested in Lu. One skilled in the art simply would not have had any logical reason to expect that Lu's material would or even could exhibit the claimed structural features. Moreover, Applicants respectfully submit that there is no disclosure or suggestion in Lu that could have given one skilled in the art any reasonable expectation that modifying the processing parameters could somehow advantageously suppress the formation of columnar silicon nitride on any otherwise undisclosed silicon nitride portions defining pores of the material. Indeed, one skilled in the art could not have arrived at the present invention in view of Lu without otherwise relying on the disclosure of the present application as a guide. It is well established, however, that such hindsight-based reasoning is impermissible.

Furthermore, in view of the fact that the processing conditions in Lu are not the same as or even similar to those used in connection with the present invention, as explained above, Applicants respectfully submit that one skilled in the art would not have had any logical reason to expect that Lu's material would have pores defined by

the silicon carbide particles and a portion of the silicon nitride binder at all, much less that such pores would have a specific surface area of $1\text{m}^2/\text{g}$ or less, as recited in independent claim 13.


For at least the foregoing reasons, Applicants respectfully submit that Lu fails to disclose or suggest each and every feature recited in independent claims 12 and 13. Accordingly, Applicants respectfully submit that independent claims 12 and 13, and all claims respectively depending therefrom define patentable subject matter over Lu, and respectfully request that the above rejection be reconsidered and withdrawn.

If the Examiner believes that contact with Applicants' attorney would be advantageous toward the disposition of this case, the Examiner is herein requested to call Applicants' attorney at the phone number noted below.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-1446.

Respectfully submitted,

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Date



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